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富士フィルム(吉田商)

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PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Shoichiro Yasunami, et al. : Group Art Unit: 1752

Appn. No.: 10/642,291 : Examiner: CHU, JOHN S Y

Filed: August 18, 2003

For: NEGATIVE RESIST COMPOSITION

DECLARATION UNDER 37 C.F.R. §1.132Assistant Commissioner for Patents
Alexandria, VA 22313-1450

Sir:

I, Shoichiro Yasunami, do declare and state as follows:

I am a citizen of Japan.

I graduated from Kyusyu University, Faculty of Engineering, Course of Materials Synthesis in March 1991.

Since April 1981 I have been employed by Fuji Photo Film Co., Ltd. and since June 1998 I have been engaged in research and development of photoresist for semiconductors at the Yoshida-Minami Factory Research Division of the company.

I am a co-inventor of the invention described and claimed in the above-named application, and I am familiar with the subject matter disclosed by the application as well as the Office Action dated December 16, 2004 concerning the application.

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EXPERIMENTATION

Example A and Comparative Example A

Solutions of negative resist compositions in Example A and Comparative Example A were prepared using the following compounds in the same manner as in Example 1 of the present specification. Example A has the same constitution as Comparative Example A except for using a crosslinking agent (MM-1) as Compound (C) in Comparative Example A. The Comparative Example A has the same constitution as Example 6 of Shioota (U.S.P. 6,190,833)).

	Compound (A)	Compound (B)	Compound (C)	Compound (D)	Additive	Solvent
Example A	A-3 (60)	B-2 (15)	MM-1 (25)	D-2 (3.0)	(E) (20)	MMP
Comparative Example A	A-3 (60)	B-2 (15)	C-2 (25)	D-2 (3.0)	(E) (20)	MMP

In the above Table:

A-3: poly(p-vinylphenol), Mw=3,000;

B-2: tetramethoxymethyl glycoluril;

C-2: novolak type epoxy resin;

D-2: 2,4-trichloromethyl-(4'-methoxystyryl)-6-triazine;

E: butadiene-acrylonitrile-methacrylic acid copolymer, molar ratio=60/35/5;

Solvent: MMP (3-methoxymethyl propionate); and

MM-1: phenol-type crosslinking agent MM-1, which is described in the present specification.

A formation of resist film, a formation of pattern by an electron-beam drawing and an evaluation (Sensitivity, Resolution, Profile shape (Pattern profile))

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and Line edge roughness) were performed in the same manner as in Example 1 of the present specification. The result is set forth in the following Table.

	Sensitivity ($\mu\text{C}/\text{cm}^2$)	Resolution (μm)	Pattern Profile	Line Edge Roughness (μm)
Example A	5.5	0.09	Rectangular	0.09
Comparative Example A	12.5	0.10	Taper	0.15

As apparently seen from the above Table, Example A of the invention using the phenol-type crosslinking agent exerts an unexpected and excellent effect, particularly in Sensitivity, Profile shape and Line edge roughness.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Respectively submitted,

Date: 03/11/05

Shoichiro Yasunami
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